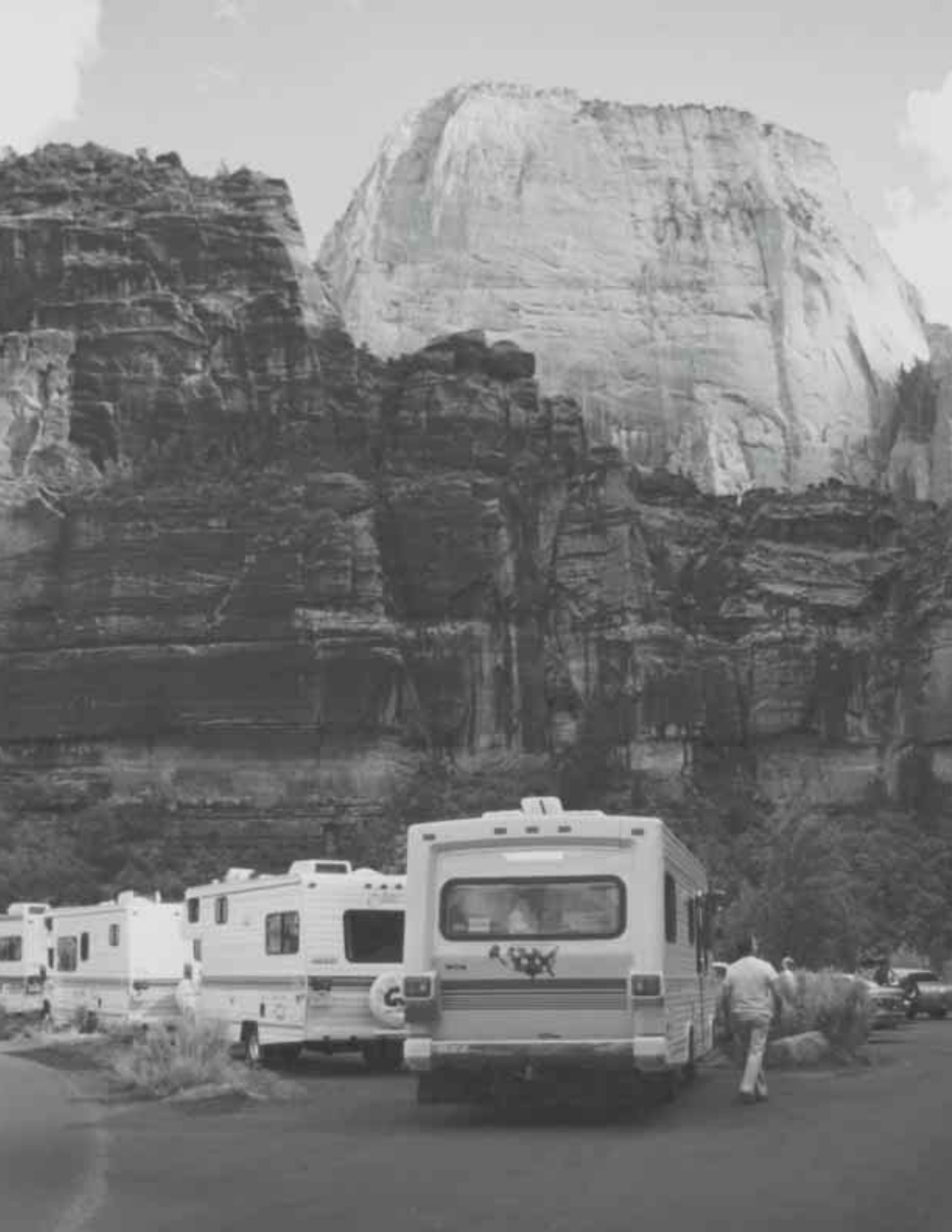

A foundation of good resource management decision-making is the application of sound scientific information. Within parks, many impacts to resources can be averted through careful planning that makes use of science early on and applies it rationally throughout the process. Visitor use planning, for example, is one area in which the National Park Service is taking innovative steps to address park crowding and its attendant natural resource degradation issues. During 1997, the Park Service made substantial progress in planning for alternate transportation systems at Zion and Grand Canyon National Parks. Additionally, infrastructure planning is helping to correct resource impacts at Sequoia and Yosemite National Parks through the removal, redesign, and relocation of visitor use facilities to less sensitive areas in these parks. All in all, planning can be insightful and facilitate environmental protection, resource sustainability, and the preservation of park natural values as long as science is a partner in the process.

Transportation

Changing the way people use parks

by Darla Sidles

Zion Canyon will be a quieter, gentler place, just after the turn of the century. That is when the canyon shuttle system is scheduled to begin, operating from the south end of the gateway town of Springdale, Utah, through Zion Canyon, to the Temple of Sinawava. This system will not only transport people, but will also fundamentally change the way people use and understand the park. Zion National Park is leading an increasing trend in heavily congested park areas to eliminate private vehicles in favor of shuttle systems as a method of managing overcrowding.

Annually, over 2.5 million people visit Zion, and approximately 50% of them drive up the scenic canyon. Towering cliffs hug the winding, 6-mile stretch of road, narrowing in places to less than a quarter-mile wide. During summer days, as many as 2,000 vehicles crowd this fragile canyon corridor. The problem of managing traffic congestion and visitor use here is not new, however. Zion's 1977 Master Plan called for the study of an interpretive transportation system to solve congestion problems and provide better educational opportunities for visitors. Now, 20 years later, the Canyon Transportation System Environmental Assessment was approved. Funds were also approved for half of the shuttle vehicle acquisitions. Progress is assured, but is often slow. Contracting for construction of related facilities was scheduled for 1997, but was postponed until review by the NPS Development Advisory Board.

Despite some temporary setbacks, the transportation system is still on schedule for debut in the year 2000. Benefits are numerous. Traffic gridlock will be eliminated, providing higher quality, safer visitor experiences. Removing private traffic will reduce

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On summer days, as many as 2,000 vehicles crowd Zion Canyon, a fragile 6-mile corridor in Zion National Park (Utah). Traffic gridlock, safety, resource impacts, and a degraded visitor experience are all management concerns related to high numbers of motor vehicles in the scenic canyon.

Zion National Park

vegetation impacts along roadside overflow parking areas. Additionally, shuttle fleet design includes measures to improve air quality by utilizing internal combustion propane-fueled vehicles to reduce emissions. Mechanical noise in the canyon will also be reduced both by the absence of private vehicles, and by noise reduction measures incorporated into the shuttle design.

Zion National Park

A proposed transportation shuttle will replace private automobiles in the canyon in approximately two years, alleviating traffic congestion and parking problems. It will also reduce vegetation impacts, noise, and exhaust along the popular roadway.

The Zion shuttle system also presents some unknowns. The park is not certain how the transportation system will affect the numbers of people visiting the canyon, or what impacts other areas may experience due to visitor redistribution. The shuttle system, by eliminating the traffic and parking dilemma, may actually increase visitation to the canyon. The question then becomes, how should the park best manage the sheer numbers of people? The first few years of shuttle operation will help answer some of these questions.

The Zion system can be used to distribute people within the canyon, thereby managing visitor flow. If visitation increases, however, the visitor "carrying capacity" may be exceeded. In the future, capacity limits may be necessary in order to preserve the resources and visitor experience. As a follow-up to the general management plan currently in preparation, visitor use and resource condition indicators and standards will be developed to guide future decision-making.

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Adaptive Management

Preserving the Colorado River ecosystem through adaptive management

by Norm Henderson

The experimental flood released from Glen Canyon Dam (Arizona) in 1996 through Grand Canyon National Park and Glen Canyon National Recreation Area focused national attention on the benefits that could be derived from operating a dam based in part on the needs of the downstream river ecosystem. During 1997, the National Park Service made further progress in protecting the Colorado River from the effects of dam operations. Through a newly formed adaptive management process, the Secretary of the Interior hopes to provide a scientific basis for proper dam management, taking into consideration the environmental, recreational, cultural, power, and water-delivery concerns of 25 different stakeholder groups. This cooperative approach to dam management is known as the Glen Canyon Dam Ad-aptive Management Program and is expected to usher in a new era of dam management in the West.

Before 1992, the Bureau of Reclamation managed Glen Canyon Dam, like most other large western dams, primarily to ensure water delivery and electric power generation. Input into the management process by those with other concerns was limited. In the early 1980s, however, concern about the environmental effects of ongoing dam operations increased sharply. Environmental advocacy groups contended that the operation of the dam was causing continued resource degradation, specifically noting the erosion of beaches and the loss of sandbars. In addition, fish species, including the endangered humpback chub, riparian

vegetation, and near-shore cultural resources were also affected.

This heightened awareness culminated in the passage of the Grand Canyon Protection Act in 1992. This act required the Secretary of the Interior to first prepare an environmental impact statement (EIS) to fully evaluate the resource impacts of current dam operations, and then to change dam management priorities to include a full range of resource protection measures. The act also required the secretary to study and monitor the effects of any actions he took, and to consult with a wide spectrum of interest groups in all aspects of dam management.

To help implement the requirements of the act, the EIS proposed an adaptive management program, which was adopted by Secretary Babbitt in January 1997. Adaptive management is a process whereby various beneficial resource management alternatives are considered and actions are recommended to the secretary based on input from a formal stakeholder group. The ecosystem response to these actions is carefully monitored to determine if resource condition objectives are being achieved. Based upon the results of the monitoring program, modifications in management may be proposed and evaluated. This program provides broad input into dam operations and other actions that may be taken by the secretary to protect or improve riverine resources.

The Adaptive Management Workgroup (a federal advisory committee) manages the adaptive management process and has 25 members appointed by the secretary. The Superintendent of Grand Canyon National Park represents both Grand Canyon National Park and Glen Canyon National Recreation Area on this committee. During 1998, the committee will evaluate and recommend to the secretary an overall budget for fiscal year 2000 (likely over $7 million), a comprehensive science program to evaluate the effects of current and proposed actions taken by the secretary, the construction of a selective withdrawal structure to warm the water downstream of the dam for endangered fish, and the installation of spillway gate additions to enable better management of habitat enhancing and unplanned flood flows. In addition, a 45,000 cubic-foot-per-second management flood flow during spring could be recommended, which, like the 1996 experimental flood, may increase sandbar deposits and riparian habitat.

A planned light rail system will transport future day-use visitors to Grand Canyon National Park from the gateway community of Tusayan, while alternative-fuel buses will make connections along the South Rim. Announced in November, the new transportation system is expected to replace most private vehicles in the year 2000 in the South Rim area while helping to protect park resources and maintain a quality visitor experience.

Since it began operating in 1965, the Glen Canyon Dam has been managed primarily to ensure water delivery and electric power generation. Recent adoption of an adaptive management process, however, now allows for broader concerns, including the needs of the downstream river ecosystem, to be considered in dam operations.

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Wildlife Management

Teton bison management plan completed

by Steve Cain

Working closely with the public, conservation groups, and other government agencies, Grand Teton National Park (Wyoming) produced a long-term bison management plan that promises to satisfy most concerned parties. Exhaustive public input and reviews proved to be one key to success in this planning process.

In 1948, 20 bison were reintroduced into Jackson Hole from Yellowstone National Park. These bison were confined in the Jackson Hole Wildlife Park, a 1,500-acre enclosure for displaying prominent indigenous wildlife that was supported by Wyoming, the New York Zoological Society, and a private land corporation. In 1950 the expansion of Grand Teton National Park encompassed this holding and management of the area began shifting to the National Park Service. In 1968, the 16 bison in the herd at that time were allowed to roam free. The herd grew slowly until 1980; after the animals discovered supplemental winter elk feed on the National Elk Refuge, which borders the park to the south, the herd's number grew from about 35 individuals to its current size of nearly 400.

In 1991, the park and the refuge, in cooperation with the Wyoming Game and Fish Department and Bridger-Teton National Forest, released a scoping statement for the preparation of a long-term management plan and environmental assessment for the Jackson bison herd. Each of the four primary management issues to be addressed in the plan—herd size, herd reduction methods, winter distribution, and disease—was contentious. A draft environmental assessment was released in 1994, a final environmental assessment was released in 1996, and a "finding of no significant impact" (FONSI) was released in 1997.

The FONSI contained several major changes from the final plan due to new scientific information and public comment. Major provisions of the FONSI and final plan include: (1) controlling herd size through both a managed public hunt on the refuge and surrounding national forest lands, and through donation of animals to Native American tribal governments and low income groups; (2) maintaining a post-hunt herd size of 350 to 400 animals; and (3) minimizing overlap of bison and cattle, and vaccinating bison against brucellosis when a demonstrated safe and effective vaccine is available.

Compared to the Yellowstone bison herd, the Jackson herd and the local situation differ in ways that

Congress has enacted two new laws that will encourage open space conservation surrounding national parks. P.L. 105-81 authorized a study of the significance of pastoral lands within and adjacent to Grand Teton National Park (Wyoming). Since 1977, the price of land in the Jackson Hole area has increased an average of 600%, which has tempted large landowners (such as ranchers) to sell their land for subdivision. The subdivision of large tracts of land has reduced the amount of open space in the valley and has resulted in loss of wildlife habitat and the fragmentation of migration routes. In a more far-reaching effort, Congress also enacted P.L. 105-34, which provides for tax incentives for landowners, in or within 25 miles of a national park or wilderness area, who preserve open space through conservation easements.

were key to the successful completion of the plan. While herds in both areas have brucellosis, the Jackson herd roams primarily on Department of the Interior lands year-round. This avoids the need for agricultural agencies to kill large numbers of disease-exposed bison as they leave park lands, such as has occurred on Yellowstone's borders. In addition, having grazed livestock in the vicinity of free-roaming bison for nearly 30 years, local cattle producers are more accepting of the herds than some of their Montana counterparts. These factors, as well as dedication and good cooperation among the federal and state agencies, responsiveness to public interests, and support of the final plan by key environmental organizations that included the Jackson Hole Conservation Alliance, Greater Yellowstone Coalition, and Wyoming Wildlife Federation, were all critical components of this successful planning process. In celebration, the local conservation community held an unprecedented "plan completion party" for government and conservation organization participants alike.

Grand Teton National Park, Mark Schroder

Numbering nearly 400, bison in Grand Teton National Park (Wyoming) will be managed according to a bison management plan, completed during 1997. Herd size will be held to 350-400 members through a combination of a managed public hunt and donation of animals.

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Partners conserve jaguars in the Desert Southwest

by Lee A. Benson and Bill E. Van Pelt

In this century, jaguars *(Panthera onca)* almost disappeared from this country. In an effort to avoid the legal and economic problems associated with listing the jaguar as an endangered species, biologists, land managers, and ranchers in southeastern Arizona and southwestern New Mexico formed a partnership in 1997 to develop a conservation plan. The group hoped to demonstrate to the U.S. Fish and Wildlife Service that conservation actions for the jaguar could occur at the state level and that federal listing would not be necessary. Although the jaguar was federally listed as endangered in 1997, the partnership accomplished many positive conservation actions and continues to function very much like an endangered species recovery team, proving conclusively that individuals with different agendas can work together successfully.

The jaguar conservation partnership is composed of 16 federal, state, and county agencies, including the National Park Service. The Arizona and New Mexico Game and Fish Departments have been key members and initiators of the effort. Any interested parties can participate. Current members include nonprofit conservation organizations, livestock associations, and private citizens as well as interested federal, state, and county agencies.

In 1997, the partnership drafted a conservation agreement and strategy for the management of the jaguar. The agreement identifies major objectives for the conservation of the species that meet science-based management and education goals. To date, work has been completed on determining historic and current numbers of jaguars, establishing management protocols, assembling a scientific advisory group, and developing an Internet web site (www.gf.state.az.us). Next year the partners will focus on developing habitat criteria for the jaguar to assist land management agencies and for producing information about the jaguar for dissemination to the public.

One of the biggest problems with managing for a species such as the jaguar is the lack of information specific to the animal in the United States. Closing this gap will be a primary task for the jaguar conservation partnership in the coming months and years.

The jaguar is a federally endangered species in southeastern Arizona and southwestern New Mexico. During 1997, the National Park Service participated in a grassroots partnership to conserve the species.

Arizona Game and Fish Department

International Planning

Assessing the effects of NAFTA on border water resources

by Mark Flora

"La frontera," the culturally distinct U.S.-Mexico border region, changed indelibly with the 1994 implementation of the North American Free Trade Agreement (NAFTA). In addition to creating opportunities for economic development, the agreement will affect the natural resources shared by both nations along the border. At the time, the Secretary of the Interior chartered the U.S.-Mexico Border Field Coordinating Committee for the purpose of facilitating better coordination among bureaus of the Department of the Interior (DOI) in addressing environmental issues within the border area. The committee identified water resources as a primary concern, including water quality and quantity in several units of the national park system. To better categorize the water-related issues, a team of water-resource specialists from several agencies, including the National Park Service, delineated watersheds along the 1,920-mile border and divided the region into eight areas with similar hydrologic and geographic features.

During 1997, the committee published a fact sheet that gives an overview of the water-resource issues of the "Mexican Highlands" border area. The Mexican Highlands is nearly 22,000 square miles in size (25% in Mexico; 75% in the U.S.) and contains 14 basins that drain to rivers in southeastern Arizona, southwestern New Mexico, northern Sonora, and northwestern Chihuahua. Extensive tracts of DOI lands coincide with the highlands, including Saguaro National Park, Buenos Aires National Wildlife Refuge, the San Pedro Riparian National Conservation Area, Chiricahua National Monument, San Bernardino National Wildlife Refuge, Coronado National Memorial, Tumacacori National Historical Park, and Fort Bowie National Historic Site.

Limited water quantity and impaired water quality represent the greatest water-resource challenges in the highlands. Activities such as irrigated agriculture, urbanization, and industry compete for and affect the quantity and quality of these shared-water resources. Prior to 1940, the basin aquifers were in hydrologic equilibrium—that is, water inflow was approximately equal to outflow, based on long-term flow conditions. Since then, withdrawal and use have affected water quantity, often depleting stream flows, lowering local and regional aquifers, reducing spring discharge, and generally decreasing riparian habitat. This has sometimes resulted in significant effects on biological, cultural, and physical resources in the area.

Natural Resource Information Division

The first assessment of potential impacts to water resources as a result of NAFTA focused on a border area named the "Mexican Highlands." Fact sheets on border water resource issues contain priorities for action and are available on the World Wide Web at www.doi.gov/fcc and from the NPS Office of Mexican Affairs (howard_ness@nps.gov) and the Water Resources Division (mark_flora@nps.gov).

Another issue is the effect of contaminants on water quality. Industrial effluent (primarily metals and organic contaminants from border *maquiladoras* or factories), inadequately treated sewage, and agricultural chemical and nutrient runoff are examples. Additionally, the committee is concerned about the effect of water-quality degradation on plant and animal communities and their habitats. Riparian areas, such as the nationally significant San Pedro Riparian National Conservation Area are host to a wide variety of amphibians, reptiles, and mammalian species, including numerous species of birds that are obligate riparian users. In addition, the distinctive riparian plant communities in Saguaro National Park, Coronado National Memorial, and Chiricahua National Monument are dependent upon groundwater being near the surface.

The recent efforts of the committee and water resources team inaugurate a program that will provide a border-long assessment of water resource issues affecting DOI lands. Information gained from these assessments will allow NPS managers to better understand complex, interrelated water management issues affecting natural resource management within their units.

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Professionalization of resource management gained a little ground during 1997 when the Resources Careers task group drafted position descriptions for 26 professional and nine technical resource management occupations. Established by the Careers Council of the Vail Agenda, the Resources Careers Initiative is under review by the NPS Na-tional Leadership Council for implementation and funding guidance.